M2R Exam – Semantic web: from XML to OWL
Semantic web part

Duration : 1h

Documents allowed – no communication device allowed

October 2016

Note: Read all the questions carefully before answering.

RDF

Consider the graph G describing holiday packages:

```
_:b1 rdf:type o:Package .          _:b3 rdf:type o:Package .          _:b4 rdf:type o:Package .
_:b1 o:destination d:Salvador .    _:b3 o:destination d:Moskow .      _:b4 o:destination d:Kobe .
_:b1 o:accomodation d:PousadaDesArts . _:b3 o:accomodation d:Metropol . _:b4 o:accomodation d:ToyofukuRyokan .
d:PousadaDesArts rdf:type o:Pousada . d:Metropol rdf:type o:GrandHotel . d:ToyofukuRyokan o:type o:Ryokan .
_:b1 o:activity _:b2 .             _:b3 o:activity d:VolgaCruise .    _:b4 o:activity _:b5 .
_:b2 rdf:type o:Swimming .         d:VolgaCruise rdf:type o:Cruise . _:b5 rdf:type o:SwordFighting .
```

1. Draw the graph G.

2. Define an RDF-interpretation $\mathcal{I}$ of G.

3. Given the following graph H:

   ```
   _:x rdf:type o:Package .
   _:x o:accomodation _:acc .
   _:x o:activity _:act .
   ```

   Does your interpretation satisfies H (said otherwise, is $\mathcal{I}$ a model of H)?

4. Does $G \models H$? Show it.

5. Given the following graph K:

   ```
   _:y rdf:type o:Package .
   _:y o:accomodation _:acc .
   _:acc rdf:type o:Local .
   _:y o:activity _:act .
   _:act rdf:type o:Sport .
   ```

   Does $G \models K$? Tell why.

RDFS and OWL interpretation

Consider the ontology O made of the following statements:

```
o:accomodation rdfs:range o:Accomodation .
o:Local rdfs:subClassOf o:Accomodation .
o:Pousada rdfs:subClassOf o:Local .
o:Ryokan rdfs:subClassOf o:Local .
o:GrandHotel rdfs:subClassOf Accomodation .

o:activity rdfs:range o:Activity .
o:Sport rdfs:subClassOf o:Activity .
o:Swimming rdfs:subClassOf o:Sport .
o:SwordFighting rdfs:subClassOf o:Sport .
o:Visit rdfs:subClassOf o:Activity .
o:Cruising rdfs:subClassOf o:Visit .
```

6. Does $G \models_{RDFS}$ `o:Package rdf:type rdfs:Class`?
   Does $O \models_{RDFS}$ `o:Package rdf:type rdfs:Class`?

7. Does $O \cup G \models_{RDF} K$? $O \cup G \models_{RDFS} K$? Explain why.

8. Given the OWL axiom (making the OWL ontology O'):

   $$\texttt{o:TonicPackage} \equiv \texttt{o:Package}$$
   $$\sqcap \exists\texttt{o:accomodation.}(\texttt{o:Local} \sqcap\, \geq_1 \texttt{o:swimmingPool})$$
   $$\sqcap \exists\texttt{o:activity.o:Sport}$$

   Give the OWL interpretation of TonicPackage ($E_C(\texttt{o:TonicPackage})$)?

9. Does $O \cup O' \cup G \models_{OWL}$ `_:b rdf:type o:TonicPackage`? Tell why.

10. Can you express a SPARQL query returning all `o:TonicPackage` as defined in the OWL axiom of question 8?